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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/588,698	08/08/2006	Tadahiro Ohmi	039262-0156	9929
22428 7590 04/10/2008 FOLEY AND LARDNER LLP SUITE 500 3000 K STREET NW WASHINGTON, DC 20007				
EXAMINER EVERHART, CARIDAD				
ART UNIT		PAPER NUMBER		
2891				
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04/10/2008		PAPER		

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/588,698

Applicant(s)

OHMI ET AL.

Examiner

Caridad M. Everhart

Art Unit

2891

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-25 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-25 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/55/08)
- Paper No(s)/Mail Date 8-8-2006
- 4) ☐ Interview Summary (PTO-413)
- Paper No(s)/Mail Date ____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: ____

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-3,5,7,9,16-19, 21, and 23 are rejected under 35 U.S.C. 102(b) as being anticipated by Chen et al (US 5,994,233).

Chen et al disclose a method for forming openings in silicon oxide layers (col. 1, lines 12-14). The method applies RIE etching in a SAC process in MOS processing (col. 1, lines 27-32 and 34-41). The first etch step applies higher RF power than the second etch step, and the lower power is applied in the second etch step without break in the application of power (col. 3, lines 1-10 and 60-67). Chen et al further discloses that the SAC openings are formed between the gates (col. 1, lines 50-56), and this is in the processing of SRAM devices (col. 1, lines 35-40), so that this is in a process in which openings are being formed to source and drain regions is implied by the disclosure made by Chen et al. The first etch has a chemistry which includes more oxygen than the second etch (col. 3, lines 37-43 and 55-60).

Claims 1-4,6,8, 11-15, 20, 22, and 25 are rejected under 35 U.S.C. 102(b) as being anticipated by Yang et al (US 6,083,845).

Yang et al disclose that a byproduct of the etching is formed over the source and drain regions in order to protect the regions during the etch (col. 5, lines 35-45). Yang et

al further disclose that the dielectric thickness is about 2.2 micrometers(col. 1, lines 47-60), and that the first etch may leave 500 Angstroms for the second etch (col. 4, lines 62-67 and col. 5, lines 1-7). Protective polymer formed as an etching byproduct is formed on the bottom of the contact opening and prevents damage to the source and drain regions(col. 5, lines 12-25 and 30-40). The first and second steps have different compositions of etchants for etching and forming a protective byproduct polymer(col. 2, lines 9-22 and 28-39). The etchant mixture includes compounds of C and F and O(col. 5, lines 7-12).

Claims 1-4, 6, 13, 14, 16-19, are rejected under 35 U.S.C. 102(b) as being anticipated by Ko (US 2004/0038546A1).

Ko discloses forming SAC openings in the formation of a DRAM or FET device(paragraphs 0001 and 0002). A protective polymeric layer is formed during the etching (paragraph 00080). The polymeric layer that forms during etching provides protection for the underlying layer(paragraph 0009). The dielectric is oxide such as BPSG(paragraph 0018). The etching method is RIE etching(paragraph 0024). The etchants contain F and C and oxygen is also added(paragraphs 0021 and 0031). The first etch is at a higher power than the second etch(the tables following paragraphs 0037 and 0039). Fig. 7 shows that the opening is made to a source or drain region. The tables which show the etch conditions also show that the fluorocarbon flow rate is decreased in the second etch relative to the first etch, The Tables after paragraphs 0042 and 0043 show that the total flow rate can be changed for the second etch relative to the second, with the flow rate for the second etch reduced.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 10 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yang et al as applied to claims 1 and 16 above, and further in view of Ikeda et al (US 2002/0039843A1).

Yang et al is silent with respect to the relative thickness of the protective layer.

Ikeda et al disclose forming a hole or trench(paragraph 0001) in a silicon oxide layer using compounds which include C and F and form a deposit during etching(paragraph 0009). The protective polymer formation is controlled(paragraph 0088). The formation of polymer formed at the sides and the bottom of the opening is controlled(paragraph 0097).

It would have been obvious to one of ordinary skill in the art at the time of the invention to have formed the polymer at the relative thickness recited in the claims in the process taught by Yang et al because Ikeda et al disclose that the thickness of the polymer formed can be controlled.

The prior of record not relied upon is considered relevant to applicant's disclosure.

Qiao et al (US 6,803,318)

Qiao et al discloses a method for the formation of MOS devices(col. 1, lines 15-25) which includes contacts to diffusion regions(col. 13, lines 62-67). The first etch etches 85-95% or the thickness of the dielectric layer(col. 17, lines 35-45).

Su et al (US 6,337,277B1).

Su et al discloses etching a low k dielectric layer(col. 3, lines 61-67) using fluorocarbons or hydrofluorocarbons(col. 4, lines 1-7). In the first portion of the etch or the first step of

the etch sidewall polymer is formed(col. 4, lines 14-22). The etch composition is altered for the second etch step by altering the ratios of C and F(col. 6, lines 58-67 and col. 7, lines 9-20).

Tsuchiya (US 2005/0263487A1).

Tsuchiya discloses formation of SAC openings, which implies openings to source and drain regions(paragraph 0002). The openings are formed in silicon oxide layers(paragraph 0011) and the etching is an RIE etching(paragraph 0007). Etch rates for the first stage of etching is faster(paragraph 0052) than for the second stage. The first and second stages have different etch recipes(Table 2 after paragraph 0057 and Table 3 after paragraph 0058). The Tables after paragraphs 0071 and 0072 show a higher power for the second stage than for the first stage.

Ni et al (US 2003/0045114A1).

Ni et al discloses etching openings in dielectric layers such as BPSG or TEOS layers(paragraph 0001 and 0002). The etchants such as fluorocarbons and hydrofluorocarbons with oxygen or sulfur-containing gases added result in sidewall protective polymer formation during the etching, including polymer formation at the bottom of the opening(paragraphs 0006 and 0007). The polymer formation can be controlled in order to control the profile of the openings(paragraphs 0007 and 0019).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Caridad M. Everhart whose telephone number is 571-272-1892. The examiner can normally be reached on Monday through Fridays 7:30-4:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, B. Baumeister can be reached on 571-272-1722. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Caridad Everhart/
Primary Examiner
AU 2891

4-9-2008